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WOOD, PHILLIPS, KATZ, CLARK & MORTIMER
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CHICAGO, IL 60661

EXAMINER

TRAN, NHAN T

ART UNIT	PAPER NUMBER
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2622

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/527,778	Applicant(s) WOLTERINK ET AL.	
	Examiner NHAN T. TRAN	Art Unit 2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-8 and 10-33 is/are pending in the application.
- 4a) Of the above claim(s) 17 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20-33 is/are allowed.
- 6) ☒ Claim(s) 1-4,6-8 and 10-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, filed 9/19/2008, with respect to claims 1-4, 6-8, 10-16, 18-33 rejected under 35 U.S.C 112, first paragraph, have been fully considered and are persuasive. The rejection of these claims and their dependent claims has been withdrawn.

2. Applicant's arguments, filed 9/19/2008, with respect to claims 1-4, 6-8, 10-19 have been fully considered but they are not persuasive.

The Applicant submits:

(i) Suda et al. reference clearly teaches to avoid an air gap. Suda et al. also teaches that the space between the semi-conductor wafer and the optical element assembly is to be filled by an adhesive layer in such a way that the formation of an air layer therein is to be prevented. This means that Suda et al. clearly teaches away from the combination of technical parameters as set forth in present claim 1.

(ii) Suda et al. does not provide the person of ordinary skill in the art with any incentive to combine the teachings of Figures 1A/1B with the teachings of Figure 26B. The construction of the image pick-up modules are fundamentally different, especially regarding the configuration of the "spacer 102" of Figures 1A/1B. The spacer 102 is a glass plate extending over the whole structure of the image pick-up module. There is no "hole" in spacer 102, nor is there any air gap. In addition, the Suda et al. reference clearly teaches that the method for fixing the spacer 502 to the semi-conductor chip 503 is a SOI method (and not using an adhesive). Therefore, it is respectfully maintained

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that a person skilled in the art would never introduce adhesive 105 into the construction as shown in Figure 26B.

In response, the Examiner understands the Applicant's arguments but respectfully disagrees for the following reasons:

(i) Suda does teaches an air gap in Fig. 26B where an air gap is formed between the image sensor 503 and the lens substrate 603 by providing the spacer substrate 522. Thus, the limitation of "the spacer substrate comprises a hole coaxially positioned relative to a main optical axis of the lens element" is clearly met by Fig. 26B of Suda. It appears that the Applicant mainly relies on the disclosure of Fig. 1A/1B to conclude that the air gap is prevented in Suda. However, Fig. 1A/1B is only used to provide a suggestion of adhesive layer which comprises one of ultra-violet curing resin and thermo-hardening resin (see previous office action mailed 5/16/2008).

(ii) It is respectfully submits that the fundamental teaching of Fig. 26B in Suda cannot be destroyed or inoperable when slightly modified to only provide an adhesive layer comprising one of ultra-violet curing resin and thermo-hardening resin between the space substrate 522 and image sensor 503 in view of the suggestion of adhesive layer 105 in Fig. 1A/1B, paragraph [0137]. Again, the Applicant appears to replace the structure of Fig. 26B with structure of Fig. 1A/1B for conclusion of teaching away. However, one skilled in the art would easily recognize that minor modification to form an adhesive layer with one of ultra-violet resin and thermo-hardening resin would not change the fundamental of air gap in Fig. 26B but rather providing an alternative for

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adhering process, thereby providing more adhering options to artisan in addition to the SOI process depending on type of imaging application to be manufactured.

In view of the above, the rejection is maintained.

Claim Objections

3. Claim 20 is objected to because of the recitation of "the adhesive layers each comprise" in line 5 of the claim. This should be corrected to read as -- the adhesive layers each comprises --. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 recites "the adhesive layer." However, it is not clear which adhesive layer is being referred to because there two different adhesive layers (first and second adhesive layers) required in the independent claim 1.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

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the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-4, 7, 8, 10-13, 18 & 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (US 2004/0012698).

Regarding claim 1, Suda discloses a camera device (Fig. 56, paragraph [0373]) comprising an image capturing element (image sensor 1104 and details shown as element 503 in Fig. 26B, paragraph [0237]), a lens substrate (512 in Fig. 26B) carrying a lens element (601, 603), wherein said lens element projects an object on the image capturing element, a spacer (522) located between the lens substrate and the image capturing element, wherein the spacer comprises first and second adhesive layers (the first adhesive layer is between 522 and 503, and the second adhesive layer is 509) and a glass spacer substrate (522) for maintaining a predetermined distance between the lens substrate and the image capturing element (see Fig. 26B and paragraphs [0243] and [0235]), wherein *one of the adhesive layers (second layer 509) comprises one of a ultra-violet curing resin and thermo-hardening resin*, wherein said spacer substrate is adhered to said image capturing element (503) by means of the first adhesive layer, and said lens substrate (512) is adhered to said spacer substrate by means of the second adhesive layer (509), wherein the spacer substrate comprises a hole coaxially positioned relative to a main optical axis of the lens element (see Fig. 26B and paragraph [0243]).

Although Suda discloses, in paragraph [0243], the first adhesive layer between spacer 522 and image sensor 503, Suda does not explicitly disclose (in the embodiment

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of Fig. 26B) that the first adhesive layer also comprises one of ultra-violet curing resin and thermo-hardening resin. However, in the first embodiment (Figs. 1A & 1B), Suda teaches the first adhesive layer (105) which comprises *one of a ultra-violet curing resin and thermo-hardening resin* (see paragraph [0137]).

Therefore, it would have been obvious to one of ordinary skill in the art to use one of a ultra-violet curing resin and thermo-hardening resin to form the first adhesive layer between spacer 522 and image sensor 503 in Fig. 26B of Suda in an alternative adhering process, thereby providing more adhering options to artisan in addition to the SOI process depending on type of imaging application to be manufactured.

Regarding claim 2, Suda also discloses the adhesive layer (509) has the shape of a rim outside a projection of the hole on the spacer means coaxially positioned relative to a main optical axis of the lens element (see Fig. 26C).

Regarding claims 3 & 4, please refer to claim 1.

Regarding claim 7, it is also seen in Fig. 26B that the spacer further comprises a cover substrate (560).

Regarding claim 8, in another configuration in Fig. 40B, Suda further teaches that the cover substrate (501 in Fig. 40B) comprises a second lens (801) substrate having a second lens element (801) for projecting an object on the image capturing element, the

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main optical axis of the lens element coinciding with the main optical axis of the second lens element (see Fig. 40B and [0295]-[0298]).

Regarding claim 10, although Fig. 26B of Suda shows a third adhesive layer (550) that is located between the spacer substrate (522) and the cover substrate (560), the embodiment of Fig. 26B does not disclose that the adhesive layer is a ultra-violet curing resin. However, similar to claim 1, an adhesive layer can be implemented by a ultra-violet curing resin as suggested in Fig. 1A/1B, paragraph [0137]. Therefore, it would have been obvious to one of ordinary skill in the art to use a ultra-violet curing resin for the third adhesive layer in an alternative adhering process, thereby providing more adhering options to artisan in addition to the SOI process depending on type of imaging application to be manufactured.

Regarding claim 11, Suda further discloses that the lens element is of replication type (see Figs. 26A-26C for the lens element being replicated to form a same type of lens to make a plurality of lens elements).

Regarding claim 12, as shown in Fig. 26B & 40B, the lens is formed as a convexity in the lens substrate.

Regarding claim 13, as shown in Figs. 26B & 40B, the lens is formed as a concavity in the lens substrate.

Regarding claim 18, Suda discloses a wafer scale package (Figs. 7 & 31) comprising a base substrate (110 in Fig. 7 or 910 in Fig. 31) having a plurality of image capturing elements (plurality of image sensors 912), wherein the package further comprises a lens substrate having a plurality of lens elements associated with respective image capturing elements (see Fig. 31 and 26B; paragraphs [0257]-[0259] and [0243]), and a glass spacer substrate (522 in Fig. 26B) for maintaining a predetermined distance between the lens substrate and the base substrate, whereby the position of the lens substrate relative to the base substrate is fixated by means of an adhesive layer securing said lens substrate to said spacer substrate, and another adhesive layer securing said spacer substrate to said base substrate, wherein the adhesive layers comprise one of a ultra-violet curing resin and thermo-hardening resin, wherein the spacer substrate comprises a hole coaxially positioned relative to a main optical axis of the lens element (see the analysis of claim 1 for the similar subject matter).

Regarding claim 19, Suda also discloses that optical assembly comprises a lens substrate having a plurality of lens elements (paragraphs [0152]-[0158] and [0257]-[0259]).

8. Claims 6 & 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (US 2004/0012698) in view of Broome et al. (US 6,072,634).

Regarding claim 6, Suda is silent as to the side of the hole is provided with an anti-reflection layer.

However, such anti-reflection layer is well known in the art as taught by Broome. Fig. 1 of Broome shows a lens spacer (150) which is made by *opaque black material*, wherein the side surface of spacer hole (e.g., internal surface) is either diffused or has micro grooves to prevent specular reflection of light into the rest of the lens system, thereby stray light is suppressed and aliasing effects are eliminated (see Broome, col. 5, lines 55-58 and col. 1, lines 9-11).

Therefore, it would have been obvious to one of ordinary skill in the art to configure the spacer substrate in Suda to provide an anti-reflection layer on a side of a hole of the spacer so that stray light would be suppressed and aliasing effects would be eliminated to enhance image quality as taught by Broome.

Regarding claim 16, although Suda teaches that the lens substrate (512) is provided with aperture layer but Suda is silent about that the aperture has an anti-reflection layer.

However, it is well recognized by Broome that the aperture (150) is provided with an anti-reflection layer as analyzed in claim 6 to suppress stray light and eliminate aliasing effects.

Therefore, it would have been obvious to one of ordinary skill in the art to provide an anti-reflection layer on the aperture of the lens substrate in Suda so that stray light

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would be suppressed and aliasing effects would be eliminated to enhance image quality as taught by Broome.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (US 2004/0012698) in view of Murano et al. (US 5,617,131).

Regarding claim 14, although Suda is silent as to the lens substrate is provided with a through hole whereby the lens element is located within the through hole, such lack of teaching is compensated by Murano. Murano teaches an alternative configuration for forming lens array, in which each lens element (52 in Fig. 9) is formed within a through hole of each lens substrate (56) so as to prevent stress against the lens element under thermal expansion, thereby improving focusing characteristics of the lens (see Murano, Fig. 9 and col. 9, lines 20-30).

Therefore, it would have been obvious to one of ordinary skill in the art to provide the lens substrate in Suda with a through hole whereby the lens element is located within the through hole so as to prevent stress against the lens element under thermal expansion, thereby improving focusing characteristics of the lens as suggested by Murano.

10. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suda et al. (US 2004/0012698).

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Regarding claim 15, although Suda does not explicitly disclose an infrared-red reflecting layer provided on the lens substrate in the embodiment of Figs. 1A & 1B, Suda suggests in another embodiment of Fig. 26B that an infrared cut-off filter (560) provided on a lens substrate (550) (see [0239]). Such the infrared-red cut-off layer is advantageous in that it prevents infrared light from impinging onto the photosensors, thereby enhancing image quality.

Therefore, it would have been obvious to one of ordinary skill in the art to provide an infrared-red reflecting layer on the lens substrate for preventing infrared light from impinging onto the photosensors, thereby enhancing image quality.

Allowable Subject Matter

11. Claims 20-33 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding independent claim 20, the prior art of record fails to teach or fairly suggest the *combination of all limitations* of claim 20 that includes “a second lens substrate for carrying a second lens element is stacked on said first lens substrate, aligned along the main optical axis through the second lens element, first lens element, spacer substrate and the image capturing element, wherein the spacer substrate comprises a hole coaxially positioned relative to a main optical axis of the lens element.”

Regarding claims 21-33, these claims are allowed as being dependent from claim 20.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NHAN T. TRAN whose telephone number is (571) 272-7371. The examiner can normally be reached on Monday - Friday, 8:00am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lin Ye can be reached on (571) 272-7372. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NHAN T TRAN/
Primary Examiner, Art Unit 2622